Journal of Biosocial Science (2025), page 1 of 13
doi:10.1017/S0021932025100400

CAMBRIDGE UNIVERSITY PRESS

RESEARCH ARTICLE

'The new geriatric giants': how do loneliness and social isolation contribute to probable depression in older adults?

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(Received 29 August 2024; revised 30 June 2025; accepted 8 July 2025)

Abstract

Social isolation and loneliness have been linked to adverse health outcomes such as depression in old age. However, limited data exist on the association of loneliness and social isolation with probable depression (PD) in low- and middle-income countries (LMICs), while psychosocial mediators are largely unknown. This study investigates the individual and joint associations of social isolation and loneliness with PD among older adults in Ghana. It quantifies the extent to which psychosocial factors mediate the associations. Cross-sectional data from the Aging, Health, Well-being, and Health-seeking Behaviour Study were analyzed. PD was defined as moderate to severe depressive symptoms with the Center for Epidemiologic Studies Depression (CES-D-9) scale. Loneliness and social isolation were assessed with the University of California, Los Angeles 3-item loneliness scale and the Berkman-Syme Social Network Index, respectively. Multivariable logistic models and PROCESS macro bootstrapping mediation analyses were performed. Among the 1,201 adults aged ≥50 years (M_{age} = 66.1 ± 11.9 years, 63.3% women), 29.5% PD cases were found. The prevalence of social isolation and loneliness was 27.3% and 17.7%, respectively. Loneliness (OR = 3.15, 95% CI = 3.26–5.28) and social isolation (OR = 1.24, 95% CI = 1.10–1.41) were independently associated with higher odds of PD. The loneliness and PD association was modified by spatial location ($P_{interaction}$ = 0.021); thus, the association was more pronounced in rural areas (OR = 7.06) than in urban areas (OR = 3.43). Psychosocial factors (e.g. sleep problems) mediated the loneliness/social isolation and PD association. Loneliness and social isolation were independently associated with a higher likelihood of PD, and psychosocial factors mediated the associations. Interventions to reduce PD in later life should also consider addressing loneliness and social isolation, as well as sleep problems.

Keywords: Probable depression; loneliness; social isolation; sleep problems; older adults; 'geriatric giants'

Introduction

Depression is the most common old-age psychological and psychiatric condition and is one of the major contributors to disability and mental health-related disease burden (GBD 2019 Mental Disorders Collaborators, 2022). Estimates show that depression affects approximately 280 million people globally (Abbafati *et al.*, 2020), and the COVID-19 pandemic escalated the condition for older adults who were at greater risk of the pandemic (Santomauro *et al.*, 2021). A recent meta-analysis showed that the global prevalence of depression was 35.1% (95% CI = 30.2–40.4%) among older adults (Cai *et al.*, 2023), but data from sub-Saharan Africa (SSA) provide a looming picture (Gyasi *et al.*, 2024; Stieglitz *et al.*, 2023), with the current prevalence of 43.1% (Bedaso *et al.*, 2022), given the precarious aging circumstances in SSA.

Depression has been related to a higher risk of health problems, including cardiovascular diseases, stroke, cognitive impairments, suicide behaviours, early death, and poor quality of life among older people (Abbafati *et al.*, 2020; Choi and Marti, 2024; Gyasi and Phillips, 2020; Walker *et al.*, 2015). Given that the SSA population is currently aging dramatically, and the number of individuals ≥60 years is projected to increase from 50 million in 2020 to 67 million by 2025 and 163 billion by 2050 (WHO, 2021), the prevalence and the burden of depression in this setting are expected to increase significantly in the very near future. Notably, the already strained health system may lack the capacity to manage geriatric depression effectively (WHO, 2022). Therefore, it is crucial to identify the psychosocial-related risk factors for probable depression (PD) to promote healthy aging and sustainable development goal agendas in low- and middle-income countries (LMICs). PD is used in this study to mean the early detection of clinically undiagnosed depression using a standardized screening tool.

Indeed, some of the major psychosocial-related risk factors for PD are social isolation and loneliness, which have been recognized as 'the new geriatric giants', with major public health concerns (Freedman and Nicolle, 2020) and are largely interrelated bidirectionally among older populations (Pan, 2024). Conceptually, loneliness connotes a subjective painful (emotional) feeling due to a discrepancy between the desired and the actual degree of connections (van Tilburg, 2021; WHO, 2025). Social isolation is a quantifiable reflection of a reduced social network size and paucity of social contact or connections (Steptoe *et al.*, 2013). These largely result from life course transitions and wilful experiences, such as the loss of family or close friends, role loss, or declining functional capacity (Hajek *et al.*, 2024). Social isolation and loneliness are highly prevalent among older adults in LMICs and are forerunners of mental disorders, including PD, particularly during the COVID-19 pandemic (Gyasi *et al.*, 2022; Hajek *et al.*, 2024; Mushtaq and Khan, 2024) due to limited opportunities for interpersonal interaction (Gyasi, 2020).

Theoretically, social isolation and loneliness may have significant biological, cognitive, and social consequences that may increase the risk of PD (Hawkley and Cacioppo, 2010). The hypothesized pathways linking these associations may include the lack of social stimulation in the brain, which can result in lower emotional reserve, negative cognitive schemas, and poorer affective resilience (Evans *et al.*, 2018). Inflammatory and stress responses in the brain, reduced immunity, poor sleep quality, and higher risk of neurodegenerative conditions have also been ascribed as important potential mechanisms (Hawkley and Cacioppo, 2010). However, the precise psychosocial pathways linking social isolation/loneliness and PD in LMICs are largely unknown. One systematic review found that all 10 studies reported a significant and positive association between loneliness and depression among older adults (Van As *et al.*, 2022). Among 9171 individuals aged ≥50 years in England, Lee *et al.* (2021) found a 1-point increase in loneliness score associated with a 0·16 (95% CI = 0·13–0·19) increase in depression score. Moreover, analyzing the English Longitudinal Study of Aging data, Zhu *et al.* (2024) found a significant and positive lagged effect of social isolation on depression among 6787 older adults ($\beta = 0.037$, $P < .001$). Furthermore, a systematic review of 127 studies found that

https://doi.org/10.1017/S0021932025100400 Published online by Cambridge University Press

larger and more diverse networks, along with closer social ties, were associated with lower depression (Reiner and Steinhoff, 2024). However, all included studies were conducted in high-income countries (HICs). This is a limitation, as HICs-based data may not be generalizable to SSA, given the differences in aging, socioeconomic status, and culture. Again, little is known about the joint associations of loneliness/isolation and geographic differences with depression, even though former studies have found rural-urban disparities in depression (Kim *et al.*, 2024; Vyas *et al.*, 2022; Wang *et al.*, 2024). As no effective depression treatment exists in the SSA region, it is particularly important to understand the modifiable risk factors for depression and their precise pathways in later life to delay or postpone the onset and progression of any clinical symptoms. Research highlighting these associations is needed to improve the mental health of aging adults, particularly in the LMIC settings (Reiner and Steinhoff, 2024).

Therefore, this study aimed to examine the associations of loneliness and social isolation with PD among older adults in Ghana. It also aimed to quantify the extent to which psychosocial factors (e.g. sleep problems (SP), loneliness, and social isolation) potentially mediate these respective associations. It was hypothesized that social isolation and loneliness would be associated with higher odds of PD among older adults. It was further expected that loneliness or social isolation and SP would, respectively, mediate the loneliness- and social isolation and PD associations.

Methods

Study design and participants

This cross-sectional study analyzed the data on the Aging, Health, Psychological Well-being, and Health-seeking Behaviour Study. This representative study aimed to understand how individual, interpersonal, and health/clinical factors contribute to well-being in old age from the SSA context. It was conducted in Ghana between 2016 and 2018 (Gyasi, 2018). Survey participants were randomly selected (using a multistage clustered sampling design approach) from non-institutionalized individuals aged 50 years or older in six districts and metropolitan areas. Detailed documentation regarding the study design, recruitment of study participants, and measurement of study data has been extensively described in the previously published literature (Gyasi *et al.*, 2019). The sample size was determined, assuming a 5% margin of error, a 95% confidence interval (CI), a 1.5 design effect, a 5% type I error, a 15% type II error, and a 50% default prevalence in the target population. With a 38% oversampling, a sample of 1247 was obtained for this study. The model reached a statistical power of 85% and a 5% (two-sided) significance level to detect an odds ratio of $\geq$2. After excluding 46 potential respondents due to unavailability and questionnaire defects, an analytic sample of 1201 community-dwelling older adults was realized (see Fig. 1). Face-to-face interviews were conducted by trained staff using a standard questionnaire. Questionnaires were translated into local dialects based on a standard procedure for quality control following the WHO translation guidelines for assessment instruments (Üstun *et al.*, 2005). The survey response rate was 96%.

Ethics issues

Ethics approval was obtained from the Committee on Human Research, Publications and Ethics (CHRPE), School of Medical Sciences, Kwame Nkrumah University of Science and Technology, and Komfo Anokye Teaching Hospital, Ghana (Ref: CHRPE/AP/507/16). In addition, written informed consent was obtained from all participants after they were briefed on the study objectives and their rights in the study. Respondents were assured of confidentiality and anonymity of the information they provided.

https://doi.org/10.1017/S0021932025100400 Published online by Cambridge University Press

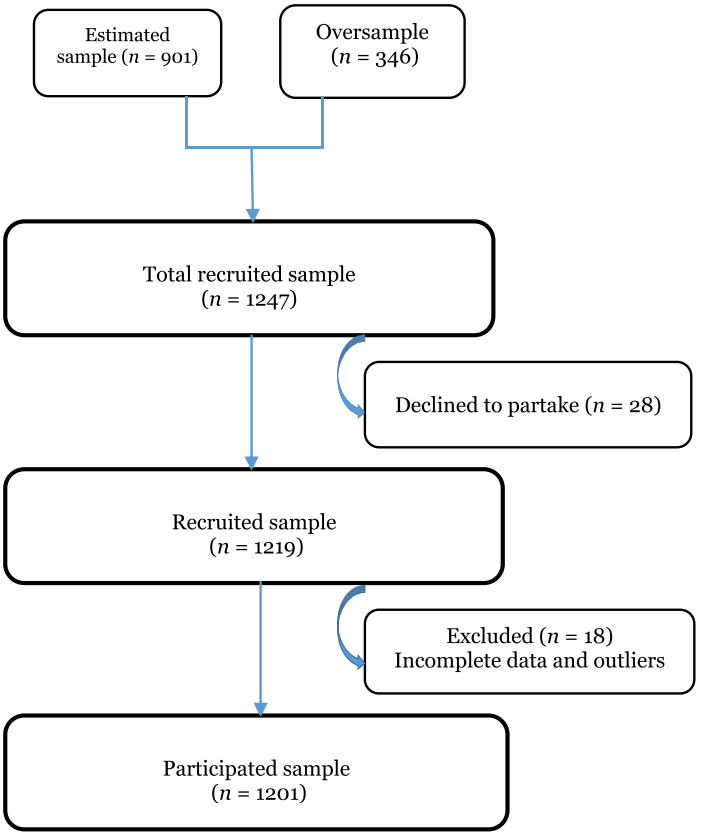

Figure 1. Flowchart of the sample selection.

Procedure

Probable depression (PD)

PD was the main outcome variable, conceptualized as having a depression symptom score above established cut points. Depressive symptoms were assessed with the Center for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977). The participants were asked ten questions about their feelings and behaviours over the past week. Each item was scored on a four-point scale: 0 = rarely (<1 day), 1 = some or a little of the time (1–2 days), 2 = occasionally or a moderate amount of time (3–4 days); and 3 = most or all of the time (5–7 days). Sleep-related item of the CES-D-10 was excluded to avoid any incidence of multicollinearity. The nine items were summed, generating an index ranging from 0 to 27; higher scores reflect greater depressive symptomology. The Cronbach's alpha of the CES-D-9 was .861 in this study. The effectiveness of CES-D in older African populations has been shown (Baron *et al.*, 2017). Based on recommended thresholds from previous research, those who scored any score equal to or above nine were classified as having PD (Miller *et al.*, 2008).

Loneliness

Loneliness was assessed with the University of California, Los Angeles three-item loneliness scale: 'How often do you feel you lack companionship?', 'How often do you feel left out?', and 'How often do you feel isolated?' Responses on a 3-point scale (1 = hardly ever or never; 2 = some of

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the time or sometimes; 3 = often or always) (Hughes *et al.*, 2004) were summed, ranging from 3 to 9. Higher scores reflected a greater degree of loneliness with Cronbach's alpha, $\alpha = 0.81$.

Social isolation

Social isolation was assessed with six items relating to the Berkman-Syme Social Network Index (Berkman and Syme, 1979). Here, 1 point was assigned to each of 1) unmarried/living alone, 2) never/once/twice contact with friends/relatives per year, 3) no social participation, 4) nobody assists you in seeking care at health facility, 5) nobody to share concerns/fears with, and 6) no feeling emotional bond with other people. Alternative responses provided for each item were assigned 0 point. The overall score ranged from 0 to 6, with higher scores indicating greater social isolation (Cronbach's alpha = .891). Continuous score was used in regression models, but categorized the index into: a) not isolated (score 0), b) moderately isolated (score 1–2), and c) severely isolated (score 3–6) for descriptive analysis (Noguchi *et al.*, 2021).

Sleep problems (SP)

SP were defined using data from a fatigue-related questionnaire with a modest-to-high sensitivity for detecting clinically relevant obstructive sleep apnoea in the general population (Senaratna *et al.*, 2017). Participants were asked: 'Overall, in the last 30 days, how much of a problem did you have with sleeping, e.g., falling asleep, waking up frequently during the night, or waking up too early in the morning'? and 'Overall in the last 30 days, how much of a problem did you have due to not feeling rested and refreshed during the day (for example, feeling tired, not having energy')? Each item had 5-point Likert response options, ranging from 1 (none) to 5 (extreme), with increasing scores indicating higher SP ($\alpha = .830$ in this study).

Covariates

The following characteristics were considered as potential covariates (Cai *et al.*, 2023; Gyasi *et al.*, 2024; Stieglitz *et al.*, 2023). Sociodemographic factors included age (in years), sex (male/female), geographic location (rural/urban), educational status (primary/secondary/tertiary), employment status (unemployed/employed), and income level (in Cedis). Lifestyle factors included alcohol consumption (no/yes) and physical activity based on the International Physical Activity Questionnaire (metabolic equivalent task – the sum of days performing walking, moderate, and vigorous activity) (Craig *et al.*, 2003). Health variables included pain severity (continuous 0–4 points) based on the Medical Outcomes Study Short Form-36 (MOS SF-36) scale (Ware *et al.*, 1995), self-rated health status (continuous 0–4 points) based on one item, mobility (continuous 2–8 points) based on two items from the MOS SF-36, diabetes status (no/yes), and hypertension status (no/yes).

Statistical analysis

All analyses were conducted using IBM SPSS V.25 Software, and the level of significance was $P < 0.05$ (two-tailed). Descriptive analyses were first calculated to describe the sample and reported as means and proportions. Second, X^2 and *t-tests were used to compare* respondent characteristics by loneliness and social isolation statuses. Next, logistic regression models were used to evaluate the associations between loneliness and social isolation and PD. Model 1 accounted for age, sex, spatial location, education, employment status, income level, pain severity, and self-rated health status. Model 2 accounted for all covariates in Model 1, as well as SP and loneliness or social isolation. Model 3 included Model 2, lifestyle factors (alcohol consumption and physical activity), and health factors (i.e. mobility limitations, diabetes, and hypertension). Next, the study tested whether geographic location moderated the associations of loneliness and

https://doi.org/10.1017/S0021932025100400 Published online by Cambridge University Press

social isolation with PD (Model 4). The interaction terms were separately added to the fully adjusted model (Model 3). In the event that a significant interaction was observed, stratified analysis using rural/urban status was performed. Finally, upon realizing a substantial attenuation of OR in Model 2, the study explored whether loneliness or social isolation and SP mediated the association of social isolation and loneliness with PD, respectively. Ordinary least squares regression-based PROCESS Macro analytic framework was used to evaluate the extent to which these potential mediators explained the association between social isolation- and loneliness-PD.

Results

Detailed characteristics of the overall sample and loneliness and social isolation statuses are shown in Table 1. Among 1201 participants, the mean (SD) age was 66.14 (11.85) years, and 63.3% were women. Most respondents lived in urban settings (55.4%) and never attended (50%) or attended only primary school (36%). Less than half were employed (44%), and income levels were generally low (307.98 [338.79]). About a third consumed alcohol (32%), 36% reported hypertension, and about 10% lived with diabetes. The prevalence of PD was 29.5%. Approximately 18% reported feeling lonely, while 27% reported being socially isolated. Loneliness and social isolation increased significantly with older age, female sex, residence in rural areas, lower levels of income and education, and physical inactivity. The socially isolated and those who reported being lonely experienced poorer health outcomes across all health measures compared to those who were not lonely or isolated. Crucially, the prevalence of PD was higher among those who were lonely (83.1% vs. 17.9%, $\chi^2(1) = 358.15$, $P < 0.001$) and socially isolated (44.2% vs. 23.9%, $\chi^2(1) = 47.11$, $P < 0.001$) compared with their respective counterparts.

Multivariable results

Table 2 presents the multivariable logistic regressions of the associations of loneliness and social isolation with PD. Loneliness and social isolation were related to PD when adjusting for age, sex, spatial location, education, employment, income, pain, and self-rated health (Model 1), with an attenuated adjusted OR of 3.15 (95% CI = 3.27–6.26) and 1.23 (95% CI = 1.09–1.38) when loneliness or social isolation and SP were taken into account (Model 2). The reduced adjusted OR for PD from 4.46 in Model 1 to 3.15 in Model 2 (in terms of loneliness) and from 1.38 in Model 1 to 1.23 in Model 2 (in terms of social isolation) suggests that loneliness or social isolation and SP may explain a substantial proportion of the association of loneliness or social isolation with PD. However, the association was almost the same with OR of 3.15 (95% CI = 3.26–5.28) for loneliness and 1.24 (95% CI = 1.10–1.41) for social isolation after further adjustment for alcohol consumption, physical activity, mobility, diabetes, and hypertension (Model 3).

Interaction and stratified analyses

The effect modification of spatial location on the association of loneliness and social isolation with depression via interaction analysis was tested (see Model 4 of Table 2). After full adjustment, there was a significant interaction between spatial location (urban vs rural) and loneliness on PD (OR = 0.57, 95% CI = 0.35–0.95). However, there was no significant effect-modifier of the social isolation-PD association by spatial location. Upon realizing the significant interaction, stratified analysis was conducted based on urban/rural status (Table 3). The association of loneliness with PD was significant in both sub-groups, but the effect was more pronounced among rural dwellers (OR = 7.06, 95% CI = 4.55–10.96) than those in urban areas (OR = 3.43, 95% CI = 2.45–4.78).

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Table 1. Characteristics of Study Sample – Overall and by Loneliness and Social Isolation Statuses

	Total	Loneliness status				Social isolation status			
		Not lonely	Lonely			Not social isolated	Social isolated		
Variable	%/M (*SD*)	%/M (*SD*)	%/M (*SD*)	χ^2/*T*-statistic	*P*-value	%/M (*SD*)	%/M (*SD*)	χ^2/*T*-statistic	*P*-value
Number	1201	988 (82.3)	213 (17.7)	–	–	873 (72.7)	328 (27.3)	–	–
Age (in years)	66.14 (11.85)	65.77 (11.86)	67.88 (11.64)	−2.37	0.018	65.68 (11.98)	67.38 (11.41)	−2.22	0.027
Female sex (*n*, %)	760 (63.30)	609 (61.60)	151 (70.91)	6.46	0.011	523 (59.9)	237 (72.3)	15.64	<0.001
Urban location (*n*, %)	661 (55.00)	571 (57.80)	90 (42.30)	17.10	<0.001	504 (57.7)	157 (47.9)	9.38	0.002
Level of education (*n*, %)									
Never	601 (50.00)	461 (46.70)	140 (65.71)	27.09	<0.001	416 (47.7)	185 (56.4)	10.59	0.014
Primary	434 (36.11)	376 (38.10)	58 (27.2)			328 (37.6)	106 (32.3)		
Secondary	104 (8.70)	94 (9.50)	10 (4.70)			76 (8.7)	28 (8.5)		
Tertiary	62 (5.21)	57 (5.81)	5 (2.31)			53 (6.1)	9 (2.7)		
Employed (*n*, %)	533 (44.40)	475 (48.1)	58 (27.40)	30.35	<0.001	423 (48.5)	110 (33.6)	21.15	<0.001
Personal income	307.98 (338.79)	326.39 (360.57)	213.89 (163.12)	4.00	<0.001	336.34 (377.49)	161.24 (9.83)	4.64	<0.001
Alcohol intake (*n*, %)	378 (31.50)	305 (30.91)	73 (34.30)	0.94	0.332	257 (29.4)	121 (36.9)	6.14	0.013
Physical activity	3.01 (1.47)	3.09 (1.44)	2.65 (1.56)	3.99	<0.001	3.11 (1.45)	2.74 (1.48)	3.89	<0.001
Diabetes (*n*, %)	121 (10.10)	88 (8.90)	33 (15.50)	8.39	0.004	88 (10.1)	33 (10.1)	0.001	0.992
Hypertension (*n*, %)	430 (35.80)	350 (35.40)	80 (37.61)	0.35	0.556	315 (36.1)	115 (35.1)	.108	0.742
Mobility limitations	4.38 (2.13)	4.17 (2.03)	5.34 (2.32)	−7.43	<0.001	4.26 (2.08)	4.69 (2.21)	−3.11	0.002
Self-rated health	3.43 (0.84)	3.35 (0.84)	3.82 (0.73)	−7.51	<0.001	3.37 (0.85)	3.61 (0.78)	−4.61	<0.001
Pain severity	3.21 (1.08)	3.11 (10.06)	3.70 (1.06)	−7.45	<0.001	3.17 (1.03)	3.32 (1.20)	−2.10	0.036
Sleep problems	4.89 (1.89)	4.79 (1.84)	5.30 (2.07)	−3.53	0.001	4.68 (1.82)	5.43 (1.96)	−6.19	<0.001
Loneliness	1.76 (0.82)	–	–	–	–	1.66 (0.76)	2.05 (0.90)	−7.56	<0.001
Social isolation	1.80 (1.46)	1.61 (1.37)	2.68 (1.54)	−10.04	<0.001	–	–	–	–
Depression status									
Not depressed	847 (70.5)	811 (82.09)	36 (16.90)	358.15	<0.001	664 (76.06)	183 (55.79)	47.11	<0.001
Depressed	354 (29.5)	177 (17.91)	177 (83.10)			209 (23.94)	145 (44.21)		

Note: M – mean score; *SD* – standard deviation; SI – social inclusion.
P-value is based on either ordinal χ^2 tests or independent sample *t*-test.

Table 2. Associations of Loneliness and Social Isolation with Risk of Depression among Older Adults: Estimated by Logistic Regressions

	Model 1		Model 2		Model 3		Model 4	
Variable	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Potential confounders	√		√		√		√	
Loneliness	4.46	(3.62–5.64)***	3.15	(3.27–6.26)***	3.15	(3.26–5.28)***	0.57	(0.35–0.95)*
Social isolation	1.38	(1.24–1.53)***	1.23	(1.09–1.38)**	1.24	(1.10–1.41)***	1.13	(0.89–1.44)

Note: Model 1 is adjusted for age, sex, spatial location, education, employment status, income level, pain severity, and self-rated health status.
Model 2 is adjusted for confounders in Model 1 and social isolation or social isolation and sleep problems.
Model 3 is adjusted for confounders in Model 2, alcohol consumption, physical activity, mobility limitations, diabetes, and hypertension.
Model 4: Contains the interaction term of loneliness × spatial location or social isolation × spatial location.
√: Potential confounding variables.
***$P < 0.001$; **$P < 0.005$; *$P < 0.05$.

Table 3. Spatial Differences in the Association between Loneliness and Depression among Older Adults: Estimated by Logistic Regressions

	Spatial location			
	Rural		Urban	
Variable	OR	(95% CI)	OR	(95% CI)
Potential confounders	√		√	
Loneliness	7.06	(4.55–10.96)***	3.43	(2.45–4.78)***
–2 Log likelihood	315.71		499.74	
Hosmer-Lemeshow Chi^2	23.86(0.02)		7.67(0.47)	
Nagelkerke R^2	0.55		0.40	

Note: OR – odds ratio; CI – confidence interval.
Each model was adjusted for age, sex, spatial location, education, employment status, income level, pain severity, self-rated health status, social isolation or social isolation, alcohol consumption, physical activity, sleep disorder, mobility limitations, diabetes, and hypertension.
√: Potential confounding variables.
***$P < 0.001$.

Table 4. Mediation Analyses on the Association of Loneliness and Social Isolation with Depression among Older Adults

	Loneliness					Social isolation				
	Total effect		Indirect effect		% Mediated	Total effect		Indirect effect		% Mediated
Mediators	*B*	(95% CI)	*B*	(95% CI)		*B*	(95% CI)	*B*	(95% CI)	
Social isolation	.497	(.450–.545)	.216	(.006–.036)	43.46	–	–	–	–	–
Loneliness	–	–	–	–	–	.116	(.085–.147)	.070	(.053–.093)	60.34
Sleep problems	.497	(.450–.545)	.190	(.002–.020)	38.23	.116	(.085–.147)	.051	(.004–.020)	43.97

Note: *B* – unstandardized regression coefficients; CI – confidence interval.
The empirical 95% CI does not include zero to define statistical significance.

Mediation analysis

Table 2 indicates that the association of loneliness and social isolation with PD was mainly explained by social isolation or loneliness and SP. Therefore, mediation analysis was conducted using adjusted Model 4 in the PROCESS Macro plug-in and bootstrapping technique (Table 4). The analysis showed that social isolation (indirect effect $B = 0.216$, 95%bootsCI = 0.006–0.036)

https://doi.org/10.1017/S0021932025100400 Published online by Cambridge University Press

explained 43.46% and SP (indirect effect $B = -0.190$, 95%bootsCI = 0.002–0.020) yielded 38.23% of the link between loneliness and PD. Moreover, loneliness (indirect effect $B = 0.070$, 95%bootsCI = 0.053–0.093) explained 60.34% and SP (indirect effect $B = -0.051$, 95% bootsCI = 0.004–0.020) mediated 43.97% of the association of social isolation with PD (Table 4).

Discussion

Principal findings

In this large and representative population-based study, loneliness (OR = 3.15; 95% CI = 3.26–5.28) and social isolation (OR = 1.24; 95% CI = 1.10–1.41) were associated with higher odds of PD even after the inclusion of a wide range of potential confounders. Furthermore, this analysis found a significant interactive role of loneliness and spatial location on PD, such that the association between loneliness and PD was stronger among rural residents than their urban counterparts. Finally, the loneliness-PD association was mediated by social isolation (43.46%) and SP (38.23%), whereas the social isolation-PD association was mediated by loneliness (60.34%) and SP (43.97%).

Theoretical interpretations of findings

The findings add to the growing literature relating social isolation and loneliness to higher odds of PD. A systematic review of 10 studies found that loneliness and social isolation were positively associated with PD (range OR = 0.41–17.76) (Van As *et al.*, 2022). In a nationally representative sample of 9,171 older English, Lee *et al.* (2021) showed that baseline loneliness was associated with greater depressive episodes. Zhang *et al.* (2023) observed in a longitudinal cohort study of 634 older in Hong Kong that those with smaller social networks and heightened loneliness levels were more likely to report higher odds of PD. Similarly, Hsueh *et al.* (2019) found among 3920 individuals in Thailand that loneliness and social isolation increased the risk of developing depressive symptomatology, including suicidal behaviours in later life. This study extends the evidence to older populations residing in the SSA context and also posits that loneliness shows a stronger association with PD than social isolation. Crucially, the present study quantifies the psychological pathways linking loneliness or social isolation and PD, as well as the modifying role of spatial variation in these associations. Indeed, no previous studies have explored these dynamics among older samples.

Several plausible interpretations of the observed associations may be ascribed. Social isolation explained nearly 44% of the loneliness and PD association, while loneliness mediated 60.34% of the social isolation and PD association. Loneliness and social isolation are directly linked (Leigh-Hunt *et al.*, 2017; Pan, 2024), and they relate positively to poor health outcomes in older adults (Noguchi *et al.*, 2021). Studies have shown that as people age, their social networks shrink due in part to the loss of a spouse or close friends, retirement, physical and cognitive limitations, or limited mobility (Corno and Burns, 2022; Wrzus *et al.*, 2013). Moreover, weak social connections via limited opportunities for friendship and a sense of belonging may erode self-confidence, self-efficacy, and motivation (Bradley *et al.*, 2023), leading to feelings of emotional isolation and loneliness. These factors can isolate or cause individuals to withdraw from social interactions, leaving them with fewer opportunities for social engagement and connection. Social isolation and loneliness, in turn, can fuel PD, including feelings of loss of purpose, hopelessness, worthlessness, grief, and diminished self-esteem and value (Wolters *et al.*, 2023).

This analysis identified SP to mediate 38.23% and 43.97% of the loneliness- and social isolation-PD links, respectively. Prior epidemiologic and clinical studies have shown that loneliness and isolation, along with emotional alienation, contribute to feelings of fear, insecurity, anxiety, and worry (Wolters *et al.*, 2023; Zhang *et al.*, 2023). These negative emotions can disrupt

https://doi.org/10.1017/S0021932025100400 Published online by Cambridge University Press

sleep by activating the body's stress response, leading to the release of the stress hormone (cortisol) and increased levels of inflammatory markers (Russell and Lightman, 2019). Increased stress response due to elevated cortisol and inflammatory markers (e.g. C-Reactive Protein, Interleukin-6, Fibrinogen) can interfere with sleep architecture (Maggio *et al.*, 2013). The disruption of the natural sleep-wake cycle may ultimately contribute to higher odds of PD in old age. In addition, loneliness and social isolation may impair the hypothalamic-pituitary-adrenal (HPA) axis and glucocorticoids (Hawkley *et al.*, 2013), which regulate stress responses and sleep patterns. The impaired HPA axis can disturb the circadian rhythm and sleep health (Incollingo Rodriguez *et al.*, 2015), disrupt neurotransmitters (e.g. serotonin and norepinephrine), and increase negative mood (Mehta *et al.*, 2020) and PD via feelings of sadness, fatigue, and hopelessness (Domènech-Abella *et al.*, 2017). Other pathways not explored in this study may be essential. For example, social isolation and loneliness strongly correlate with physical inactivity (Schrempft *et al.*, 2019). Those who are isolated or lonely tend to have reduced motivation to engage in physical exercise, and this can worsen health conditions and reduce mood-boosting endorphins (Naureen *et al.*, 2022), leading to higher odds of PD.

Furthermore, the analysis showed that geographical differences moderated the association between loneliness and PD. This finding is not entirely surprising, for previous studies have found similar observations. For example, among 5,103 older adults in China, Li *et al.* (2016) observed that those in rural areas reported more depression than their urban counterparts. People in rural settings often have smaller social networks, less access to adult-oriented services, and lower median incomes (Weaver *et al.*, 2015). These poor socioeconomic and environmental conditions are well-established risk factors for poorer mental health outcomes. Again, living arrangements in rural settings are oftentimes characterized by a high degree of dependence on close family members and friends (Kendall and Anglewicz, 2018). Loneliness levels for older adults may increase as these *confidants* migrate or pass away.

The results extend the relevant literature on the effects of loneliness and social isolation on PD in older adults in the SSA context. This study is relevant to public health and policy decisions by considering the role of psychosocial determinants of well-being, including loneliness and social isolation, in managing PD in old age. Clinicians and family caregivers should pay particular attention to socially isolated and detached older adults who are likely to experience depressive symptomatology. Interventions to embed older adults in resourceful interpersonal relationships may enhance their sense of belonging and potentially improve their experiences of depressive episodes (Gyasi *et al.*, 2019). Practical actions to mitigate loneliness and ensure social connectedness alongside specific sleep interventions may be effective options for addressing PD and its major disorders in later life. These findings suggest that efforts to reduce social isolation and loneliness to foster social connections and support may be essential to reducing the odds of experiencing PD in old age.

The strengths of the study are the large/representative sample size from the SSA context, where research on this topic is very limited, the inclusion of loneliness and social isolation measures, and the use of validated measures with strong psychometric properties. However, some limitations exist. First, the variables were measured by self-report, which may lead to social desirability and recall biases. While the use of self-report and widely used validated scales to quantify social and health variables is encouraged, future studies might consider objective assessment and tracking the loneliness/social isolation and PD levels over time. The cross-sectional design did not allow the establishment of causal inferences between loneliness/social isolation and PD.

Conclusions

The cross-sectional data indicate that social isolation and loneliness were positively associated with PD, and the associations were significantly mediated by loneliness or social isolation

https://doi.org/10.1017/S0021932025100400 Published online by Cambridge University Press

(respectively) and SP. Geographic location modified the association between loneliness and PD, rather than the association between social isolation and PD. Geographically based interventions targeting social isolation and loneliness could reduce PD by addressing SP among older adults. Future longitudinal and cross-cultural data to understand and address the causal associations of loneliness and social isolation with depression among older adults are warranted.

Author contribution. **Razak M. Gyasi:** Conceptualization, Supervision, Methodology, Formal analysis, Data curation, Writing – original draft, Writing – review and editing. **Simon Mariwah:** Data curation, Investigation, Writing – review and editing. **Simon Boateng:** Data curation, Investigation, Writing – review and editing. **Collins Adjei Mensah:** Data curation, Writing – original draft, Writing – review and editing. **Joana Kwabena-Adade:** Data curation, Investigation, Writing – original draft, Writing – review and editing. **Aminu Dramani:** Data curation, Writing – original draft, Writing – review and editing. **Joseph Osafo:** Data curation, Writing – original draft, Writing – review and editing. **André Hajek:** Conceptualization, Methodology, Writing – original draft, Writing – review and editing. **Kabila Abass:** Data curation, Writing – original draft, Writing – review and editing. **David R. Phillips:** Supervision, Methodology, Writing – review and editing.

Funding statement. This work was supported by Lingnan University, Hong Kong [grant numbers: RPG1129310], to Razak M. Gyasi (https://www.ln.edu.hk/about-lu/introducinglingnan). The funders had no role in the study design, data collection, and analysis, decision to publish, or preparation of the manuscript.

Competing interests. The authors declare no conflicts of interest.

Ethical standard. Written informed consent was obtained from all participants. Ethics approval was obtained from the Committee on Human Research, Publications & Ethics (CHRPE), School of Medical Sciences, Kwame Nkrumah University of Science and Technology, and Komfo Anokye Teaching Hospital, Ghana (Ref: CHRPE/AP/507/16).

References

Abbafati C, Abbas KM, Abbasi-Kangevari M, *et al.* (2020) GBD 2019 diseases and injuries collaborators. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet* **396**(10258), 1204–1222.

Baron EC, Davies T and Lund C (2017) Validation of the 10-item centre for epidemiological studies depression scale (CES-D-10) in Zulu, Xhosa and Afrikaans populations in South Africa. *BMC Psychiatry* **17**(1), 6.

Bedaso A, Mekonnen N and Duko B (2022) Estimate of the prevalence of depression among older people in Africa: a systematic review and meta-analysis. *Aging & Mental Health* **26**(6), 1095–1105.

Berkman LF and Syme SL (1979) Social networks, host resistance, and mortality: a nine-year follow-up study of Alameda county residents. *American Journal of Epidemiology* **109**(2), 186–204.

Bradley N, Dowrick C and Lloyd-Williams M (2023) Explaining how and why social support groups in hospice day services benefit palliative care patients, for whom, and in what circumstances. *Palliative Care and Social Practice* **17**, 26323524231214549.

Cai H, Jin Y, Liu R, *et al.* (2023) Global prevalence of depression in older adults: a systematic review and meta-analysis of epidemiological surveys. *Asian Journal of Psychiatry* **80**, 103417.

Choi NG and Marti CN (2024) Depression in older women who died by suicide: associations with other suicide contributors and suicide methods. *Journal of Women & Aging* **36**(3), 210–224.

Corno D and Burns RJ (2022) Loneliness and functional limitations among older adults with diabetes: comparing directional models. *Journal of Psychosomatic Research* **154**, 110740.

Craig CL, Marshall AL, Sjöström M, *et al.* (2003) International physical activity questionnaire: 12-country reliability and validity. *Medicine & Science in Sports & Exercise* **35**, 1381–1395.

Domènech-Abella J, Lara E, Rubio-Valera M, Olaya B, Moneta MV, Rico-Uribe LA, Ayuso-Mateos JL, Mundó, J and Haro JM (2017) Loneliness and depression in the elderly: the role of social network. *Social Psychiatry and Psychiatric Epidemiology* **52**(4), 381–390.

Evans IEM, Llewellyn DJ, Matthews FE, Woods RT, Brayne C and Clare L; CFAS-Wales Research Team (2018) Social isolation, cognitive reserve, and cognition in healthy older people. *PLoS One* **13**, e0201008.

Freedman A and Nicolle J (2020) Social isolation and loneliness: the new geriatric giants: approach for primary care. *Canadian Family Physician* **66**(3), 176–182.

GBD 2019 Mental Disorders Collaborators (2022) Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet Psychiatry* **9**, 137–150.

Gyasi RM (2018) Ageing, health and health-seeking behaviour in Ghana. Lingnan Theses and Dissertations. https://commons.ln.edu.hk/otd/41.

Gyasi RM (2020) COVID-19 and mental health of older Africans: an urgency for public health policy and response strategy. *International Psychogeriatrics* **32**(10), 1187–1192. doi: 10.1017/S1041610220003312.

Gyasi RM, Peprah P, Abass K, Pokua Siaw L, Dodzi Ami Adjakloe Y, Kofi Garsonu E and Phillips DR (2022) Loneliness and physical function impairment: perceived health status as an effect modifier in community-dwelling older adults in Ghana. *Preventive Medicine Reports* **26**, 101721.

Gyasi RM and Phillips DR (2020) Aging and the rising burden of noncommunicable diseases in sub-Saharan Africa and other low- and middle-income countries: a call for holistic action. *The Gerontologist* **60**(5), 806–811.

Gyasi RM, Phillips DR and Abass K (2019) Social support networks and psychological wellbeing in community-dwelling older Ghanaian cohorts. *International Psychogeriatrics* **31**(7), 1047–1057.

Gyasi RM, Quansah N, Boateng PA, Akomeah E, Yakubu AF, Ahiabli PA, Aikins E, Owusu-Sarpong OJ, Dumbe Y, Nimoh M, Phillips DR and Hajek A (2024) Meeting the WHO physical activity guidelines is associated with lower odds of depression in older adults: potential psychosomatic mechanisms. *The American Journal of Geriatric Psychiatry* **32**(9), 1105–1118.

Hajek A, König HH, Sutin AR, Terracciano A, Luchetti M, Stephan Y and Gyasi RM (2024) Prevalence and factors associated with probable depression among the oldest old during the Covid-19 pandemic: evidence from the large, nationally representative 'Old Age in Germany (D80+)' study. *Psychogeriatrics* **24**(4), 838–846.

Hawkley LC and Cacioppo JT (2010) Loneliness matters a theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine: A Publication of the Society of Behavioral Medicine* **40**, 218–227.

Hawkley LC, Cole SW, Capitanio JP, Norman GJ and Cacioppo JT (2013) Effects of social isolation on glucocorticoid regulation in social mammals. *Hormones and Behavior* **62**(3), 314–323.

Hsueh Y-C, Chen C-Y, Hsiao Y-C and Lin C-C (2019) A longitudinal, cross-lagged panel analysis of loneliness and depression among community-based older adults. *Journal of Elder Abuse & Neglect* **31**(4–5), 281–293.

Hughes ME, Waite LJ, Hawkley LC and Cacioppo JT (2004) A short scale for measuring loneliness in large surveys: results from two population-based studies. *Research on Aging* **26**(6), 655–672.

Incollingo Rodriguez AC, Epel ES, White ML, Standen EC, Seckl JR and Tomiyama AJ (2015) Hypothalamic-pituitary-adrenal axis dysregulation and cortisol activity in obesity: a systematic review. *Psychoneuroendocrinology* **62**, 301–318.

Kendall J and Anglewicz P (2018) Living arrangements and health at older ages in rural Malawi. *Ageing & Society* **38**(5), 1018–1040.

Kim B, Hwang J, Kim D, *et al.* (2024) Urban-rural differences in prevalence of depressive symptoms and its related factors among older adults: findings from the korean longitudinal study of aging. *Research in Community and Public Health Nursing* **35**(1), 51–63.

Lee SL, Pearce E, Ajnakina O, Johnson S, Lewis G, Mann F, Pitman A, Solmi F, Sommerlad A, Steptoe A, Tymoszuk U and Lewis G (2021) The association between loneliness and depressive symptoms among adults aged 50 years and older: a 12-year population-based cohort study. *Lancet Psychiatry* **8**(1), 48–57.

Leigh-Hunt N, Bagguley D, Bash K, Turner V, Turnbull S, Valtorta N and Caan W (2017) An overview of systematic reviews on the public health consequences of social isolation and loneliness. *Public Health* **152**, 157–171.

Li LW, Liu J, Xu H and Zhang Z (2016) Understanding rural-urban differences in depressive symptoms among older adults in China. *Journal of Aging and Health* **28**(2), 341–362. doi: 10.1177/0898264315591003.

Maggio M, Colizzi E, Fisichella A, Valenti G, Ceresini G, Dall'Aglio E, Ruffini L, Lauretani F, Parrino L and Ceda GP (2013) Stress hormones, sleep deprivation and cognition in older adults. *Maturitas* **76**(1), 22–44.

Mehta R, Giri S and Mallick BN (2020) REM sleep loss–induced elevated noradrenaline could predispose an individual to psychosomatic disorders: a review focused on proposal for prediction, prevention, and personalized treatment. *EPMA Journal* **11**(4), 529–549.

Miller WC, Anton HA and Townson AF (2008) Measurement properties of the CESD scale among individuals with spinal cord injury. *Spinal Cord* **46**, 287–292.

Mushtaq A and Khan MA (2024) Social isolation, loneliness, and mental health among older adults during COVID-19: a scoping review. *Journal of Gerontological Social Work* **67**, 143–156.

Naureen I, Saleem A, Naeem M, Bilal NM, Hassan GM, Shafiq M, Hussain M and Roohullah S (2022) Effect of exercise and obesity on human physiology. *Sch Bull* **8**(1), 17–24.

Noguchi T, Saito M, Aida J, Cable N, Tsuji T, Koyama S, Ikeda T, Osaka K and Kondo K (2021) Association between social isolation and depression onset among older adults: a cross-national longitudinal study in England and Japan. *BMJ Open* **11**(3), e045834.

Pan C (2024) Bidirectional and dynamic relationships eetween social isolation and loneliness among older adults in China. *Journal of the American Medical Directors Association* **25**(8), 105003.

Radloff LS (1977) The CES-D Scale: a self-report depression scale for research in the general population. *Applied Psychological Measurement* **1**(3), 385–401. doi: 10.1177/014662167700100306.

Reiner A and Steinhoff P (2024) The association of social networks and depression in community-dwelling older adults: a systematic review. *Systematic Reviews* **13**, 161.

Russell G and Lightman S (2019) The human stress response. *Nature Reviews Endocrinology* **15**(9), 525–534.

Santomauro DF, Mantilla Herrera AM, Shadid J, *et al.* (2021) Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. *Lancet* **398**, 1700–1712

Schrempft S, Jackowska M, Hamer M and Steptoe A (2019) Associations between social isolation, loneliness, and objective physical activity in older men and women. *BMC Public Health* **19**(1), 74.

Senaratna CV, Perret JL, Matheson MC, Lodge CJ, Lowe AJ, Cassim R, Russell MA, Burgess JA, Hamilton GS and Dharmage SC (2017) Validity of the Berlin questionnaire in detecting obstructive sleep apnea: a systematic review and meta-analysis. *Sleep Medicine Reviews* **36**, 116–124.

Steptoe A, Shankar A, Demakakos P and Wardle J (2013) Social isolation, loneliness, and all-cause mortality in older men and women. *Proceedings of the National Academy of Sciences of the United States of America* **110**, 5797–5801

Stieglitz L-M, Adams LB, Bärnighausen T, Berghöfer A, Kazonda P, Killewo J, *et al.* (2023) *Depressive Symptoms and Their Association with Age, Chronic Conditions and Health Status among Middle-Aged and Elderly People in Peri-Urban Tanzania*. Cambridge Prisms: Global Mental Health.

Üstun TB, Chatterji S, Mechbal A, Murray CJL and **WHS collaborating groups** (2005) *Chapter X: Quality Assurance in Surveys: Standards. Guidelines and Procedures*. Geneva: World Health Organization.

Van As BAL, Imbimbo E, Franceschi A, Menesini E and Nocentini A (2022) The longitudinal association between loneliness and depressive symptoms in the elderly: a systematic review. *International Psychogeriatrics* **34**(7), 657–669.

van Tilburg TG (2021) Social, emotional, and existential loneliness: a test of the multidimensional concept. *The Gerontologist* **61**, e335–e344.

Vyas CM, Reynolds CF 3rd, Donneyong M, Mischoulon D, Chang G, Cook NR, Manson JE and Okereke OI (2022) Geographic region, racial/ethnic disparities, and late-life depression: results from a large US cohort of older adults. *The American Journal of Geriatric Psychiatry* **30**(6), 703–716.

Walker ER, McGee RE and Druss BG (2015) Mortality in mental disorders and global disease burden implications: a systematic review and meta-analysis. *JAMA Psychiatry* **72**(4), 334–341.

Wang X, Xu J, Sun X, Chen Y, Pang C and Zang S (2024) Network analysis of the urban-rural differences in depressive symptoms among older adults with multiple chronic conditions: evidence from a national survey. *Geriatric Nursing* **58**, 480–487.

Ware JE, Kosinski MA and Keller SD (1995) *SF-36 Physical and Mental Health Summary Scales: A User's Manual*. Boston, MA: The Health Institute, New England Medical Center Hospitals.

Weaver A, Himle JA, Taylor RJ, Matusko NN and Abelson JM (2015) Urban vs rural residence and the prevalence of depression and mood disorder among african american women and non-hispanic white women. *JAMA Psychiatry* **72**(6), 576–583.

WHO (2021) *WHO AFRO and HelpAge International Partnering to Combat Ageism in the African Region*. Geneva, Switzerland: WHO.

WHO (2022) *Aging and Health*. Geneva: World Health Organization.

WHO (2025) *From Loneliness to Social Connection - Charting a Path to Healthier Societies: Report of the WHO Commission on Social Connection*. Geneva: World Health Organization.

Wolters NE, Mobach L, Wuthrich VM, Vonk P, Van der Heijde CM, Wiers RW, Rapee RM and Klein AM (2023) Emotional and social loneliness and their unique links with social isolation, depression and anxiety. *Journal of Affective Disorders* **329**, 207–217.

Wrzus C, Hänel M, Wagner J and Neyer FJ (2013) Social network changes and life events across the life span: a meta-analysis. *Psychological Bulletin* **139**(1), 53–80.

Zhang Y, Kuang J, Xin Z, Fang J, Song R, Yang Y, Song P, Wang Y and Wang J (2023) Loneliness, social isolation, depression and anxiety among the elderly in Shanghai: findings from a longitudinal study. *Archives of Gerontology and Geriatrics* **110**, 104980.

Zhu S, Kong X, Han F, Tian H, Sun S, Sun Y, Feng W and Wu Y (2024) Association between social isolation and depression: evidence from longitudinal and Mendelian randomization analyses. *Journal of Affective Disorders* **350**, 182–187.

Cite this article: Gyasi RM, Mariwah S, Boateng S, Adjei Mensah C, Kwabena-Adade J, Dramani A, Osafo J, Hajek A, Abass K, and Phillips DR (2025). 'The new geriatric giants': how do loneliness and social isolation contribute to probable depression in older adults? *Journal of Biosocial Science* 1–13. https://doi.org/10.1017/S0021932025100400